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Insurance Capital As A Shared Asset – Theory and Practice

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GE Insurance Solutions protects people, property and reputations. With over $50bn in combined assets, the GE Insurance Solutions group of companies is one of the world's leading providers of commercial insurance, reinsurance and risk management services.
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Overview and Asking Prices

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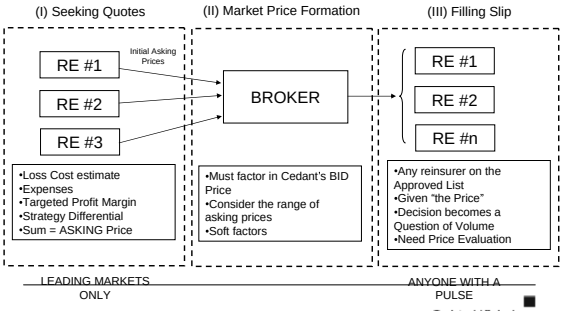
Overview

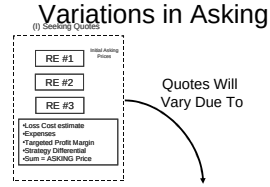
- Context: Asking Price model reflecting frictional capital costs
- Insurance capital is a Shared Asset
- Two distinct types of usage: consumptive and non-consumptive
- More appropriate financial analogue than IRR: Letter-of-Grant (~letter of credit)
- Advocates EVA as decision metric

Reinsurance Market Structure

Broker Market, Large Treaty Placements



Variations in Asking Prices



Quotes Will Vary Due To

- If Ask X is much **higher** than others:
  - May steer final price upward
  - May indicate lack of interest
  - May result in lower share being proposed
- If Ask X is much **lower** than others:
  - May steer final price downward
  - May indicate strong interest
  - May result in higher share being proposed
- Conclusions:
  - Signaling power in Quote
  - Limited arbitrage opportunity

- •Proprietary Loss Cost models
- •Internal expense loads
- •Strategy Differential (aggressive or averse signaling)
- •Profit Margin – e.g.
  - >Based on marginal impact to own portfolio
  - >Based on own funky cost of capital model
  - >Based on ownership's economic rent profit targets

Reasons Why Asking Prices **Should** Vary

1) Liquidity requires diversity of opinion and losers
2) Anti-trust
3) Parameter uncertainty
4) Information asymmetry
5) …

Room For Different Asking Price Approaches

Shared Asset – Theory

Parental Guarantees

- Merton-Perold: "risk capital" for a business unit should be cost of parental guarantee to make up any operating shortfall
- Valuing this guarantee is easy when there are capital market equivalents
- What about low liquidity, informationally opaque guarantees?
  - E.g., Insurer portfolio of liabilities

- Insurer provides shortfall guarantee to each policy it underwrites
- Guarantee is issued by the entity in total, similar to a Letter of Credit (LOC)
- Exercise of guarantee by product segment depends on:
  - Volatility
  - Price adequacy
  - Reserve adequacy
- Company must manage the timing and size of guarantee exercises (i.e., an internal bank run)

Insurer Capacity – Definition

- Legitimate standing as a counterparty is essential to their market viability → **claims-paying rating**
- Key rating variable is **capital adequacy ratio (CAR)** = Actual Capital / Required Capital
- Each rating has a **minimum CAR** associated with it
- If Actual Capital is fixed, then there is a **maximum Required Capital** constraint
- Required Capital = fn(Premium, Reserves, Assets)
- For planning purposes, assume reserves and assets are fixed → Required Capital constraint really means a **Premium Constraint**
- Required Premium Capital = **excellent proxy for underwriting capacity**

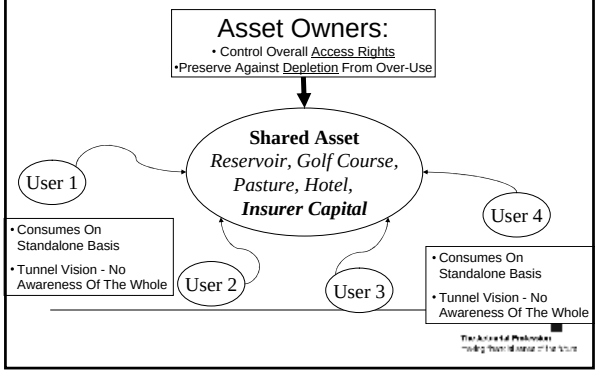
Insurer Capacity – Occupation

- Underwriting activity generates required capital
  - Either Current Year Premium or Reserves
- Since insurer is subject to a maximum Required Capital, underwriting activity **occupies available capacity**
- Longer duration business occupies capacity **for a longer time**
- Any occupation of capacity precludes the insurer from using that capacity to underwrite other products
- Clear **opportunity cost**

Required Premium Capital As Capacity Constraint

	PLAN			***IMPACT OF RESERVE STRENGTHENING***		
	Balance	Required Capital Factor	Required Capital	Balance	Required Capital Factor	Required Capital
Premium	**600**	50%	300	**420**	50%	210
Reserves	1,000	40%	400	***1,100***	40%	440
Assets	3,000	10%	300	3,000	10%	300
Actual Capital	2,000		1,000	1,900		950
Actual CAR	200%			200%		
Min CAR	200%			200%		

Insurer Capital Is A Shared Asset



Shared Assets Can Be Used Two Different Ways

- **Consumptive Use**
  - Example: RESERVOIR
  - *Permanent* Transfer To The User
- **Non-Consumptive Use**
  - Example: GOLF COURSE
  - *Temporary* Grant Of Partial Control To User For A Period Of Time
- **Both Consumptive and Non-Consumptive Use**
  - Example: HOTEL
  - *Temporary* Grant Of Room For A Period Of Time
  - Guest could destroy room or entire wing of hotel, which is *Permanent Capacity Consumption*

An Insurer Uses Its Capital Both Ways

- **1. "Rental" Or Non-Consumptive**
  - Returns Meet Or Exceed Expectation
  - Capacity Is Occupied, Then Returned Undamaged
  - A.k.a. ***Room Occupancy***
- **2. Consumptive**
  - Results Deteriorate
  - Reserve Strengthening Is Required
  - A.k.a. ***Destroy Your Room, Your Floor, Or Even The Entire Hotel***

Charge portfolio segments for both uses of Capital

Capital Usage Cost Calculation
Paying for the Parental Guarantee

- Two Kinds Of Charges:

1. **Rental** = Access fee for LOC
   → Function of *Capacity Usage* (i.e., Rating Agency Required Capital)
   → Opportunity Cost of **Occupying Capacity**
2. **Consumption** = Drawdown fee for LOC
   → Function of *Downside Potential* (i.e., segment economic shortfalls)
   → Opportunity Cost of **Destroying Future Capacity**

Charge portfolio segments for ***Both Uses*** of Capital

IRM Portfolio Mix Model
Economic Value Added or EVA

- EVA = Return – Cost of Capital Usage
- Factors in:
  - Capacity Usage (finite supply, driven by external S&P requirements)
  - Company Risk Appetite
  - Product Volatility
  - Correlation of Product with Portfolio

Powerful Decision Metric For Your Consideration

Capital Usage Charges: Calculation

1. Downside = Max(Simulated Loss > Expected Loss, 0)
2. Capital rental charge (access fee)
   (*Ex: 10% of required capital balance*)
3. Charge for drawdown on required capital (damage your room)
   (*Ex: 50% of underwriting result)*
4. Charge for drawdown beyond required capital (damage hotel)
   (*Ex: 100% of u/w result beyond capital allocation)*

Capital Usage Charge Calculation Example

- Charges:
  - **(A) Rental = 10%**
  - **(B) Within Capital = 50%**
  - **(C) Beyond Capital = 100%**
- Required Capital = **$5M**

Loss – Exp Loss	Capital Usage Cost
Trial 1: +$2M	$**5M***10% = **$500K**
Trial 2: -$3M	**$500K** + $3M*50% = **$2,000K**
Trial 3: -$8M	**$500K** + $5M*50% + $3M*100% = **$6,000K**

- Steepness of penalty depends on relative difference between **(B) Within Capital** and **(C) Beyond Capital** charges

Why is Downside Based on Loss Only?

- Sticking to the facts:
  - Earn premium, set up reserve = EP*Plan LR.
  - Remainder after expenses (if any) goes to underwriting profit ***that year***.
- For a LOB with any tail, reserve deterioration beyond Plan LR occurs in ***future years***, and therefore must be funded from ***future capital***.
- LOB profit shows up not in ***reducing*** the capital usage cost but in ***increasing*** the EVA, or in comparisons of ***actual TM versus required TM***.
- Another advantage: avoids recursion in determining required TM

Gradations of Consumption Fee?

- Financial distress costs
  - Impairment
  - Downgrade
  - Loss of market viability
  - Loss of franchise value (present value of grwoth options or PVGO)
- These increase with magnitude of capital depletion
- Kreps makes a similar argument in his “Riskiness Leverage Models” paper

Simple Pricing Examples

Example 1
Property Catastrophe Contract

			Comments
(1) Premium	$	500,000	= 5% Rate on Line
(2) Limit	$	10,000,000	
Capacity Occupation Cost			
(3) Required Capital Factor		*50.0%*	Rating Agency
(4) Required Capital	$	250,000	= (3) * (1)
(5) Opportunity Cost for Capacity		*10.0%*	r_{Opp}
(6) Capacity Occupation Cost	$	25,000	= (4) * (5)
Capital Call Cost			
(7) Probability		2.0%	
(8) Loss	$	10,000,000	Full limit loss
(9) Capital Call Amount	$	9,500,000	= (8) - (1)
(10) Capital Call Cost Function		*50.0%*	= *5 * r_{Opp}*
(11) Capital Call Charge	$	4,750,000	= (10) * (9)
(12) Expected Capital Call Cost	$	95,000	= (11) * (7)
EVA			
(13) Expected NPV	$	300,000	= (1) - (7) * (8)
(14) Expected Capital Usage Cost	$	120,000	= (6) + (12)
(15) EVA	$	180,000	= (14) - (15)

Example 2
Longer Tail Excess of Loss Contract

			Comments
(1) Premium	$	500,000	= 5% Rate on Line
(2) Limit	$	10,000,000	
Capacity Occupation Cost			
(3) Required Capital Factor - Premium		*50.0%*	Rating Agency
(3a) Required Capital Factor - Reserves		*35.0%*	Rating Agency
(3b) Reserve Amount	$	156,705	
(3c) Reserve Duration		5.00	Years
(4) Required Capital	$	524,234	= (3) * (1) + (3a) * (3b) * (3c)
(5) Opportunity Cost for Capacity		*10.0%*	r_{Opp}
(6) Capacity Occupation Cost	$	52,423	= (4) * (5)
Capital Call Cost			
(7) Probability		2.0%	
(8) Loss (NPV @ 5%)	$	7,835,262	Full limit loss, discounted
(9) Capital Call Amount	$	7,335,262	= (8) - (1)
(10) Capital Call Cost Function		*50.0%*	= *5 * r_{Opp}*
(11) Capital Call Charge	$	3,667,631	= (10) * (9)
(12) Expected Capital Call Cost	$	73,353	= (11) * (7)
EVA			
(13) Expected NPV	$	343,295	= (1) - (7) * (8)
(14) Expected Capital Usage Cost	$	125,776	= (6) + (12)
(15) EVA	$	217,519	= (14) - (15)

Argument that Opp Cost should get larger over time ~ comparable to the liquidity premium argument for a positively sloping yield curve

Pricing Implications

- No more ROE at Product level
- EVA becomes the decision metric
- Impact of product on company risk position is reflected in Cost of Capital Usage
- Another Cost = reflected by deducting from revenue
- Capital Usage Cost factors need to be calibrated
- Capital Usage Cost factors, and method, will steer portfolio composition

Demo Portfolio Model

Demo Portfolio Model

1) Loss Generator

	LOB 1	LOB 2	LOB 3	TOTAL
Log N Mu	13.771	13.691	13.571	
Log N Sigma (~CV)	30.0%	50.0%	70.0%	
Expected Loss	1,000,000	1,000,000	1,000,000	3,000,000
Profit Margin	5.0%	5.0%	5.0%	
Variable Expense Ratio	0.0%	0.0%	0.0%	
Plan Premium	1,052,632	1,052,632	1,052,632	3,157,895
Expected Loss Ratio	95.0%	95.0%	95.0%	
Return $	52,632	52,632	52,632	157,895
Plan Loss Ratio	95.0%	95.0%	95.0%	
Plan Loss $	1,000,000	1,000,000	1,000,000	3,000,000

- Simplistic simulation model to demonstrate concepts
- "Risk" represented by differences in LogN sigma (CV)
- Can also reflect "stretch" = [Plan LR – True Exp LR]

Capital Usage Costs

- One way to express "risk appetite" or "risk preference" or "emphasis"
- Determines which LOB pays how much for downside / volatility

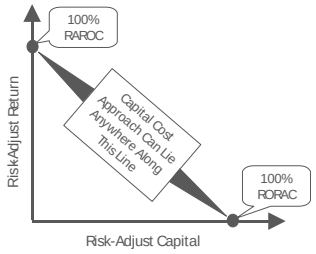
- Must be calibrated to portfolio total
- Differences between (B) and (C) reflect "kurtosis penalty" – punishing tails

3) Capital Usage Calculation

	LOB 1	LOB 2	LOB 3
Required Capital Charge on Premium	41.2%	41.2%	41.2%
Capital Usage Charge Adj Factor Due to Reserves	100.0%	100.0%	100.0%
(A) Rental Fee	5.0%		
(B) Consumption Charge Within Required Capital	10.0%	2.00	
(C) Consumption Charge Beyond Required Capital	30.0%	6.00	
Required Premium Capital	433,333	433,333	433,333

RAROC and RORAC
Two Axes of Capital Cost

- RORAC = Return on Risk Adjusted Capital
  - Most capital allocation approaches
  - Risk adjusted capital amount
  - Constant cost of capital rate
- RAROC = Risk Adjusted Return on Capital
  - Risk adjust the return
  - Only to the extent that capital amount does not reflect risk



Demo Model – RAROC vs RORAC

4) Portfolio Evaluation Metrics - RAROC

	LOB 1	LOB 2	LOB 3	TOTAL
Premium	1,052,632	1,052,632	1,052,632	3,157,895
Required Capital	433,333	433,333	433,333	1,300,000
Return	52,632	52,632	52,632	157,895
Expected Capital Usage $ Cost	28,447	38,318	53,241	120,006
EVA $	**24,184**	**14,313**	**(609)**	**37,889**
Usage Cost as % of Capital	**6.6%**	**8.8%**	**12.3%**	**9.2%**
Rental Fee	5.0%	5.0%	5.0%	**5.0%**
Consumption Charge	1.6%	3.8%	7.3%	**4.2%**
P [Exceeding Required Capital]	11.0%	16.0%	17.0%	9.0%

4) Portfolio Evaluation Metrics - RORAC

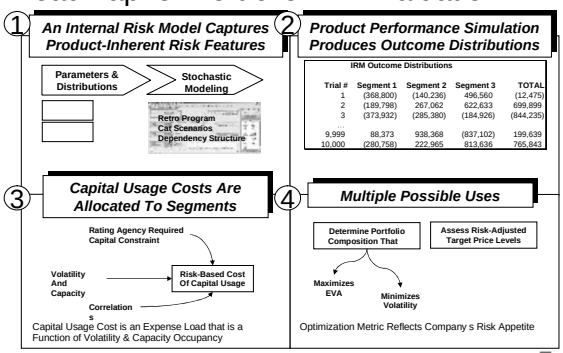
	LOB 1	LOB 2	LOB 3	TOTAL
Premium	1,052,632	1,052,632	1,052,632	3,157,895
Required Capital	160,251	393,536	746,213	1,300,000
Return	52,632	52,632	52,632	157,895
Expected Capital Usage $ Cost	14,793	36,328	68,885	120,006
EVA $	**37,838**	**16,303**	**(16,253)**	**37,889**
Usage Cost as % of Capital	**9.2%**	**9.2%**	**9.2%**	**9.2%**
Rental Fee	5.0%	5.0%	5.0%	**5.0%**
Consumption Charge	4.2%	4.2%	4.2%	**4.2%**
P [Exceeding Required Capital]	30.0%	17.0%	15.0%	9.0%

Examples

- 1) Bonehead RAROC: Capital charges (amounts) reflect exact *opposite* opinion of our volatility measure (sigma) – how does the RAROC correct for this?
- 2) VaR (99%) RORAC: Capital charge relativities based on standalone VaR (99%) for each LOB.
- How much "risk" remains unreflected – that is, how much do the returns have to vary?

Portfolio Mix Evaluation and Optimization

Roadmap for Portfolio Mix Evaluation



Portfolio Mix Evaluation

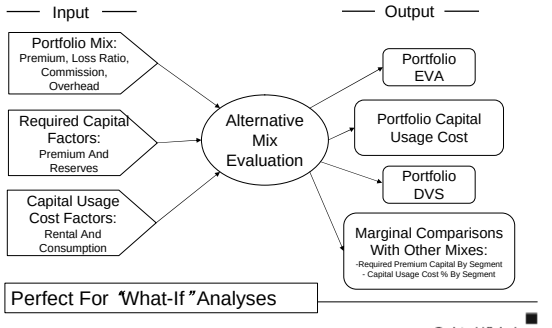
- Calibrate Total Capital Usage Cost to **X%** of Required Capital
- Can control **emphasis** of the RAROC formula:

→ Capacity-focused: Majority of Usage Cost comes from **Capacity Charges**

→ Volatility-focused: Majority of Usage Cost comes from **Volatility Charges**

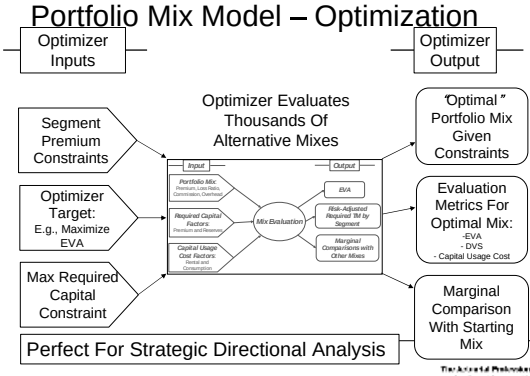
→ Balanced: 50% from each

Portfolio Mix Model – Evaluation



Perfect For "What-If" Analyses

Portfolio Mix Model – Optimization



Perfect For Strategic Directional Analysis

Summary

Risk Adjusted Cost of Capital	
Issue	***How It Will Be Addressed***
Rating Agency Required Capital is **a Binding Constraint**	Use Rating Agency Required Capital formula everywhere
But Rating Agency Capital Charges **do not reflect Our Risks**	Vary the **Target Rates of Return** instead of varying the capital amounts (RAROC)
Total Capital is really a **Shared Asset** simultaneously exposed by **all P&L's**	**Capital Usage Cost** formula works as if Finance grants the P&L's **Letters of Credit:** →Assess a **capacity charge** (like an access fee), and →a **volatility charge** (like a draw down of the LOC)

Sales Pitch: Why Consider This?

1. Complete framework that can handle both current approaches and future expansions
2. Accessible underlying philosophy
3. Reflects fundamental indivisibility of company capital
4. More realistic financial analogue than imputed equity flows = Letter of Credit
5. Ties to Finance Dept by using external required capital formulas
6. Adjusts for degree of risk reflected in external required capital formulas
7. Risk preferences are explicit
8. Reflects capacity occupation, volatility, risk preferences and correlations

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This material has been submitted to ASTIN Bulletin
Copies of working paper, presentations, and demo model available from
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Thank you
for your attention